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**BULLETIN OF THE
UNIVERSITY OF NEW HAMPSHIRE**

GRADUATE SCHOOL



Vol. XIX, No. 6 Durham, N. H. March, 1928

University of New Hampshire

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BULLETIN OF THE UNIVERSITY OF NEW HAMPSHIRE

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The Bulletin is published in September, October, November, December, January, February and March, and includes:

- The Catalog of the University
- The Report of the President
- The Financial Report
- The Catalog of the Summer School
- The Illustrated Booklet
- The Catalog of the Graduate School

and other publications of the University.

THE UNIVERSITY CALENDAR

1928-1929

SUMMER SESSION

June 25	Monday	Registration Day
June 26	Tuesday	Classes begin at 8 A.M.
Aug. 3	Friday	Summer Session closes at 4 P.M.

FALL TERM

1928

Sept. 11	Tuesday	Matriculation Day—Freshman Class
Sept. 17	Monday	Registration Day—All classes
Sept. 18	Tuesday	Recitations begin at 8 A.M.
Sept. 19	Wednesday	University Day (Afternoon holiday)
Oct. 10	Wednesday	Annual Meeting of Board of Trustees
Nov. 2	Friday	Mid-Term Warnings to be filed, 5 P.M.
Nov. 28	Wed.—Nov. 30, Fri.	Thanksgiving recess, Wed., 12:30—Fri., 8 A.M.
Dec. 10-15	Mon.—Sat.	Fall Term examinations
Dec. 15	Saturday	Fall Term closes at 12:30 P.M.

WINTER TERM

1929

Jan. 2	Wednesday	Registration Day
Jan. 3	Thursday	Classes begin at 8 A.M.
Jan. 9	Wednesday	Meeting of Board of Trustees
Feb. 6	Wednesday	Mid-Term Warnings to be filed, 5 P.M.
Feb. —	Fri.—Sat.	Winter Carnival, Fri., 12:30 P.M.—Sat., 12:30 P.M.
Mar. 12	Tuesday	Town Meeting—classes dismissed, 10 A.M.
Mar. 18-22	Mon.—Fri.	Winter Term examinations
Mar. 22	Friday	Winter Term closes at 4 P.M.

SPRING TERM

1929

Apr. 1	Monday	Registration Day
Apr. 2	Tuesday	Recitations begin at 8 A.M.
Apr. 10	Wednesday	Meeting of Board of Trustees
May 7	Tuesday	Mid-Term Warnings to be filed, 5 P.M.
May 20-22	Mon.—Wed.	Military Encampment and Inspection
May 30	Thursday	Memorial Day (Holiday)
June 10-14	Mon.—Fri.	Spring Term examinations
June 12	Wednesday	Senior examinations close at 4 P.M.
June 16	Saturday	Class Day—Alumni Day—Meeting of Board of Trustees
June 17	Sunday	Baccalaureate Day
June 18	Monday	Commencement Day

BOARD OF TRUSTEES

HIS EXCELLENCY, GOVERNOR HUNTLEY N. SPAULDING, D.S.C., *ex officio*

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* Elected by the Alumni.

OFFICERS OF ADMINISTRATION

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THE GRADUATE COUNCIL

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UNIVERSITY OF NEW HAMPSHIRE

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HAROLD H. SCUDDER, B.S., *English*
GEORGE N. BAUER, PH.D., *Mathematics*

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WILLIAM G. HENNESSY, M.A., *English*
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HAROLD M. MAYO, B.S., *Honorary Research Fellow in Chemistry*

GRADUATE STUDY AND ADVANCED DEGREES

AIMS

The Graduate School aims to meet the needs of superior students who are preparing to become teachers in colleges or universities, or investigators, and to offer opportunities to qualified students for a more advanced training than that which they may obtain in an undergraduate course.

ADMINISTRATION

Graduate work is offered, under the supervision of the Director of the Graduate School, by competent members of various departments of instruction and research. These members constitute the Faculty of the Graduate School.

The general administrative functions of the Faculty are delegated to the Director and the Council.

ADMISSION

A student who holds a bachelor's degree, or its equivalent, from an approved college or university, will be admitted to graduate study. In general a student must have credit in not less than 90 time units, or the equivalent, in the department in which he wishes to be admitted to major.

Admission to graduate study does not necessarily imply admission to candidacy for an advanced degree. Students who are not planning to become candidates for an advanced degree may be admitted to graduate study upon the recommendation of the heads of the departments concerned, and with the approval of the Director of the Graduate School.

A student may major or minor only in the departments represented in the catalog of the Graduate School. However, a graduate student who is not a candidate for an advanced degree may be admitted to graduate study in departments not represented in the Graduate School catalog, upon recommendation of the departments concerned and with the approval of the Graduate Council.

TUITION AND FEES

Tuition is \$150 for residents of New Hampshire and \$250 for non-residents. For non-resident students who entered the University before the end of the college year 1927-28, the tuition is \$225. Tuition is paid in advance in three equal installments, one on the first day of each term.

UNIVERSITY OF NEW HAMPSHIRE

A diploma fee of \$5 is charged upon graduation. Charges will be assessed for extraordinary breakage or damage. No laboratory or course fees are charged. Payment of the tuition fee entitles the student to admission to all varsity athletic games and contests.

Members of the regular college staff (and their immediate families) registered for 30 or more time units shall be granted scholarships. A scholarship will reduce the tuition charge to \$25 per term. Members of the regular college staff and their immediate families registering for less than 30 time units will be required to pay \$.50 per time unit.

HONORARY FELLOWSHIPS FOR VISITING SCHOLARS

Professors or other eminent scholars who may desire temporarily the privileges of the library and the research facilities of the University, and who are not candidates for a degree, may, upon recommendation of the Director of the Graduate School, and the approval of the President of the University, be appointed as honorary fellows without stipend. Honorary fellows shall not be required to pay any charges except, possibly, the cost of unusually expensive supplies or equipment.

DEPARTMENTAL ASSISTANTSHIPS

Graduate assistantships which usually require half-time service at a stated salary are available in a number of departments. Graduate assistants are charged in accordance with the regulation pertaining to the members of the college staff. The residence requirement for a Master's degree for holders of these appointments is not less than two years. Inquiries regarding these assistantships should be addressed to the head of the department concerned.

SUPPLIES

Books, drawing instruments, materials, etc., may be purchased at the University bookstore in Thompson Hall.

ROOMS

The University has four dormitories for women and five for men. All rooms are heated, lighted and furnished. Bed linen, quilts, and towels, however, are provided by the individual student. Each women's dormitory is equipped with a laundry. In many cases three students occupy a suite of rooms. Prices range from \$63 to \$120 a year for each student. Applications for rooms in the dormitories should be addressed to the Registrar, University of New Hampshire, Durham, N. H.

GRADUATE SCHOOL

A deposit of \$5 must accompany each application for a room, this deposit to be forfeited if the room accepted is not occupied by the applicant. The deposit is held as a guarantee against breakage, and will be returned upon the payment of any bills for damage at the close of the year, or upon the applicant's withdrawal from the University.

Reservation for rooms will be cancelled ten days before the registration date noted in the current college catalog unless one-third of the annual rent has been paid before that date.

Rooms paid for and not accepted one day after registration will be declared vacant and the room rent returned, unless the individual having the reservation makes a written request to the Registrar to hold the room until a later date. The advance payment of the room will not be returned to those making this special request. No rooms will be reserved more than ten days after the registration date. Early application is necessary in order to secure a choice of rooms. Rooms may be secured in private houses for about the same prices as for those in college dormitories.

Women students, unless living at home, are required to room in the women's dormitories, or in approved houses. A competent matron is in charge of each women's dormitory.

BOARD

The University operates on a self-service basis a modern, well-appointed Commons. Both regular weekly board and cafeteria service are provided. Exact cost records are kept, and prices are adjusted in such a manner as to give students the advantage of changing costs.

REGISTRATION

A student desiring to register for graduate study must submit to the Director of the Graduate School the official application for admission to graduate study. Blanks for this purpose may be obtained from the Secretary of the Council.

Upon admission to graduate study, a student first pays his fee at the Business Office and then deposits his enrollment cards with the Registrar.

REQUIREMENTS FOR GRADUATE CREDIT

Graduate credit will not be allowed to undergraduate students unless such credit has been approved in advance by the Director of the Graduate School.

UNIVERSITY OF NEW HAMPSHIRE

A graduate student taking a subject for graduate credit which is not primarily for graduates may be required to do additional work beyond that required of undergraduates who are taking the same subject.

Graduate credit may be given for subjects not listed in the Graduate School catalog if recommended by the major and minor departments concerned, and approved by the Director of the Graduate School.

A student will not receive graduate credit for a subject in which he has obtained a grade lower than 70.

ADVANCED DEGREES

Two types of advanced degrees are conferred: (a) Master of Science and Master of Arts, given only in course, and (b) the professional degrees, Mechanical Engineer and Electrical Engineer, conferred only upon graduates of this institution, and based upon the quality of their professional work and the presentation of a satisfactory thesis. Information in regard to the professional degrees may be obtained from the Dean of the College of Technology.

REQUIREMENTS FOR THE MASTER'S DEGREE

Residence.—A minimum of one full academic year, or four summer sessions, in residence is required.

Credits.—An average grade of at least 80 in not less than 150 time units is required, of which not less than 80 or more than 100 time units shall be devoted to the major subject (including the thesis), and not less than 30 or more than 50 time units shall be devoted to the minor subjects. Work in allied departments will be accepted for credit provided such work is properly correlated with the major subject. Not over 50 time units may be given for a thesis. Of the total time units required for an advanced degree, not more than half will be allowed a candidate on admission from another institution. Credits for the thesis shall be recorded in the registrar's office as "Thesis Credits."

Candidacy.—At least six months previous to the time the degree is sought, an application for admittance to candidacy must be submitted to the Council for its approval; and if a thesis is required, the candidate must file with the Council, for its approval, a brief outline of the thesis project as recommended by the head of the department in which the thesis work is being done.

Examinations.—All candidates must meet the regular departmental requirements as to examinations in the subjects for which they are reg-

GRADUATE SCHOOL

istered, and the requirement of a special comprehensive examination, by the heads of the departments in which the major and minor subjects have been taken, three months previous to the time the degree is sought. In addition, the candidate must pass an oral examination by a special committee designated by the Council and including the heads of the departments in which the major and minor subjects have been taken, before the candidate may be recommended for the Master's degree.

Thesis.—All theses must be typewritten upon standard paper, eight and one-half by eleven inches, medium weight, neatly bound in a black cloth cover, gilt-lettered on the outside cover with the title, name of author, degree sought, and year of graduation. The title page should bear the following statement: "A thesis submitted to the University of New Hampshire in partial fulfillment of the requirements for the degree of Master of Arts (Master of Science)."

Whenever a thesis is printed in any periodical, it must be designated as having been accepted as a Master's thesis by the University of New Hampshire.

Two bound copies must be filed before Commencement Day, one with the Librarian and one with the head of the department in which the major work has been done.

DESCRIPTION OF SUBJECTS

Prerequisites for the subjects described in this catalog are stated with reference to the subject numbers found in the general catalog of the University.

AGRICULTURAL AND BIOLOGICAL CHEMISTRY

THOMAS G. PHILLIPS, *Professor*

STANLEY R. SHIMER, *Instructor*

Students majoring in this department are expected to have had preparation in the biological sciences, in physics and in general, analytical and organic chemistry. Physical chemistry and a reading knowledge of German or French are desirable. The library and equipment of the Experiment Station are available for the use of graduate students.

SUBJECTS FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

4-b. Physiological Chemistry. The chemistry of animal physiology, including the chemistry of carbohydrates, proteins, fats, the cell, enzyme action, digestion, absorption, metabolism and excretion.

Prerequisite: Agricultural Chemistry 3-c or equivalent preparation in organic chemistry and quantitative analysis. Given only in alternate years beginning with 1929-30. Lec., 2 hrs.; lab., 2½ hrs.; prep., 3½ hrs.; 8 units.

5-c. Physiological Chemistry. The qualitative and quantitative examination of blood and urine.

Prerequisite: Agricultural Chemistry 4-b. Given only in alternate years beginning with 1929-30. Lec., 1 hr.; lab., 5 hrs.; prep., 2 hrs.; 8 units.

6-a. Plant Chemistry. A more advanced study of the chemistry of plant growth.

Prerequisite: Agricultural Chemistry 3-c or equivalent preparation in organic chemistry and quantitative analysis. Given only in alternate years beginning with 1928-29. Lec., 2 hrs.; lab., 2½ hrs.; prep., 3½ hrs.; 8 units.

GRADUATE SCHOOL

7-a, 8-b, 9-c. Agricultural Analysis. A study of the methods of analysis of fertilizers, feeding-stuffs and other products important in Agriculture.

Prerequisite: At least 15 units in Quantitative Analysis and 20 units in Organic Chemistry. Lab., 8 hrs.; prep., 2 hrs.; 10 units.

19-c. Dairy Chemistry. A study of the chemistry and methods of analysis of milk and other dairy products.

Prerequisite: Agricultural Chemistry 3-c or equivalent preparation in organic chemistry and quantitative analysis. Given only in alternate years beginning with 1928-29. Lec., 1 hr.; lab., 5 hrs.; prep., 2 hrs.; 8 units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

10-a, 11-b, 12-c. Advanced Biochemistry. The preparation, composition and analysis of proteins, carbohydrates and fats. Readings, discussions and laboratory work. 10 units each.

13-a, 14-b, 15-c. Special Problems. Conferences and library and laboratory work on such topics as enzymes, physico-chemical methods, and certain phases of plant or animal nutrition and metabolism. Subject matter and credits to be arranged.

16-a, 17-b, 18-c. Seminar. 3 units each.

BOTANY

O. R. BUTLER, *Professor*

MARIAN E. MILLS, *Assistant Professor*

STUART DUNN, *Instructor*

20-a. Morphology of the Algae. Study of the habits, structure, life histories and relationships of the various groups of the algae.

Lab., 6 hrs.; assigned reading, 2 hrs.; 8 units. Given in alternate years with 24-a.

21-b. Morphology of the Bryophytes. Study of the structures, life histories and relationships of the liverworts and mosses.

Lab., 6 hrs.; assigned reading, 2 hrs.; 8 units.

22-c. Morphology of Gymnosperms. Study of the structure, life histories, relationships and classification of gymnospermous plants.

Lab., 6 hrs.; assigned reading, 2 hrs.; 8 units. Given in alternate years with 23-c.

UNIVERSITY OF NEW HAMPSHIRE

23-c. Morphology of Angiosperms. Study of the structures, life histories and classification of the flowering plants.

Lab., 6 hrs.; assigned reading, 2 hrs.; 8 units. Given in alternate years with 22-c.

24-a. Plant Ecology. A study of the external factors affecting the plants' economy, structure, duration of life and typographical distribution of species; plant communities, plant associations, and plant succession.

Prerequisite: Botany 25-c. Conferences, assigned reading and reports; 5 units. Given in alternate years with 20-a.

25-c. Systematic Botany. A study of the higher plants of our native flora. The student is required to prepare an herbarium of 90 plants.

Prerequisite: Botany 1-a, 2-b, 3-c. Conferences, field and laboratory work; 8 units.

26-a. Plant Histology. General morphology of the tissue systems; the primary tegumentary tissue; the fundamental tissue system, the vascular tissue system, development of secondary members, formation of secondary tissue.

Prerequisite: Botany 6-a. Lab., 8 hrs.; assigned reading, 2 hrs.; 10 units.

27-a. Plant Physiology. A study of imbibition, osmosis, absorption, conduction, transpiration, guttation and the effect of environmental factors upon these phenomena; water relations of plants.

Prerequisite: Botany 5-c. Lab., 8 hrs.; assigned reading, 2 hrs.; 10 units.

28-b. Plant Physiology. A study of mineral nutrition, photosynthesis, physical and chemical properties of chlorophyll, effect of external and internal conditions on carbon dioxide assimilation, products of assimilation, photoperiodism.

Prerequisite: Botany 5-c. Lab., 8 hrs.; assigned reading, 2 hrs.; 10 units.

29-c. Plant Physiology. Digestion of carbohydrates and fats, hydrolysing enzymes, respiration, oxidising enzymes, intramolecular respiration, digestion of proteids, proteolytic enzymes, effect of external conditions on growth; paratonic and autonomous movements.

Prerequisite: Botany 5-c. Lab., 8 hrs.; assigned reading, 2 hrs.; 10 units.

GRADUATE SCHOOL

30-a, -b, -c. Literature of Plant Physiology. Assigned reading of monographs and other important literature of Plant Physiology.

Prerequisite: Botany 5-c. Conferences and written reports. Credits to be arranged.

31-a, -b. Diseases of Fruits. The bacterial and fungous diseases of fruits, their symptoms, cause and prevention.

Prerequisite: Botany 13-b. Lab., 5 hrs.; assigned reading, 2 hrs.; 7 units. Given in alternate years with 32-a, -b.

32-a, -b. Diseases of Vegetables. The bacterial and fungous diseases of vegetables, their symptoms, cause and prevention.

Prerequisite: Botany 13-b. Lab., 5 hrs.; assigned reading, 2 hrs.; 7 units. Given in alternate years with 31-a, -b.

33-b. Fungicides. Preparation and use of fungicides and a study of their effect upon the higher plants and parasitic organisms.

Prerequisite: Botany 13-b. Lab., 6 hrs.; assigned reading, 2 hrs.; 8 units.

34. Mycology. Morphology, physiology and classification of the Schizomycetes, Myxomycetes, and Phycomycetes.

Lab., 6 hrs.; assigned reading, 2 hrs.; 8 units.

35. Mycology. Morphology, physiology and classification of the Ascomycetes, Basidiomycetes and Fungi imperfecti.

Lab., 6 hrs.; assigned reading, 2 hrs.; 8 units.

CHEMISTRY

CHARLES JAMES, *Professor*

GEORGE A. PERLEY, *Associate Professor*

HEMAN C. FOGG, *Assistant Professor*

RICHARD H. KIMBALL, *Instructor*

Graduate study in chemistry is open to those who have completed the chemistry course of either the College of Liberal Arts or the College of Technology, or some similar course of study. Excellent opportunities are offered for research in general and analytical chemistry. A large number of problems with plenty of material are available in the field of rare metals.

UNIVERSITY OF NEW HAMPSHIRE

28-b, 29-c. Quantitative Analysis. A preliminary study of quantitative analysis to familiarize the student with the general methods of chemical manipulation and analysis.

Prerequisite: 23-a, or 25-a. Lab., 7½ hrs.; prep., 1 hr.; 8½ units.

30-a, 31-b. Advanced Quantitative Analysis. This includes analysis of minerals, alloys, etc.

Prerequisite: 29-c. Lab., 15 hrs.; prep., 1 hr.; 16 units.

32-c. Advanced Quantitative Analysis. Continuation of 31-b, together with gas analysis and the application of special instruments to quantitative analysis.

Lab., 10 hrs.; prep., 2 hrs.; 12 units.

40-a. Organic Chemistry. Lectures and recitations. A study of the chemistry of the carbon compounds.

Prerequisite: One year of Freshman Chemistry. Rec., 2 hrs.; prep., 3 hrs.; 5 units.

41-b, 42-c. Organic Chemistry. A continuation of 40-a.

Rec., 3 hrs.; prep., 4½ hrs.; 7½ units.

43-b, 44-c. Organic Chemistry Laboratory. The work in this subject consists mainly of laboratory practice in preparing and purifying organic compounds. Lectures and recitations will be held from time to time in connection with the practice.

Prerequisite: Chemistry 40-a. Lab., 5 hrs.; 5 units.

52-a, 53-b, 54-c. Advanced Organic Chemistry. A consideration of the more advanced theories of organic chemistry.

Prerequisite: 42-c or 48-c. Rec., 3 hrs.; prep., 4½ hrs.; 7½ units.

55-a. Advanced Organic Laboratory. Advanced preparation and practice in quantitative analysis of organic compounds.

Prerequisite: Chemistry 54-c. Lab., 15 hrs.; prep., 2½ hrs.; 17½ units.

60-a, 61-b, 62-c. Physical Chemistry. Advanced study of chemical theory, covering vapor density, molecular weights, specific heat, diffusion of gases, solutions, ionization, catalysis, colloids, thermochemistry, equilibrium, the phase rule, etc.

Prerequisite: Chemistry 3-c or one year Freshman Chemistry. Rec., 3 hrs.; prep., 4½ hrs.; 7½ units.

GRADUATE SCHOOL

64-b, 65-c. Physical Chemistry Laboratory.

Prerequisite: Chemistry 60-a. Lab., 5 hrs.; prep., 2 hrs.; 7 units.

80-a, 81-b, 82-c. Advanced Inorganic Chemistry.

Rec., 2 hrs.; lab., 2½ hrs.; prep., 3 hrs.; 7½ units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

301. Practical Spectroscopic Analysis. The subject matter includes a study of absorption, spark, arc and phosphorescent spectra, together with the procedure for the detection of the rarer elements, the preparation of vacuum tubes, and the calibration of a spectroscope.

Lab., 7½ hrs.; 7½ units.

302, 303, 304. General Chemistry. This will cover certain selected topics.

Rec., 2 hrs.; lab., 2½ hrs.; prep., 3 hrs.; 7½ units.

305. The Rare Earths.

Rec., 3 hrs.; prep., 4½ hrs.; 7½ units.

306, 307, 308. Quantitative Analysis. The complete analysis of complex minerals, and determinations presenting more than ordinary difficulties.

Lab., 7½ hrs.; 7½ units.

309, 310. Chemistry of the Rarer Elements. An introduction to this field of chemistry.

Rec., 2 hrs.; lab., 2½ hrs.; prep., 3 hrs.; 7½ units.

EDUCATION

JUSTIN O. WELLMAN, *Professor*

HARLAN M. BISBEE, *Assistant Professor*

NAOMI G. EKDAHL, *Instructor*

JOHN C. HERRING, *Instructor*

The objectives for graduate students in education are a sound educational philosophy, expertness in research, and technical efficiency in administration and supervision.

Students whose undergraduate records or whose technical experiences are prognostic of success in attaining the above objectives will be admitted to graduate study in education.

UNIVERSITY OF NEW HAMPSHIRE

Candidates for a Master's degree must present, in addition to a Bachelor's degree, 50 time units in education from the following courses, or their equivalents: Education 21-a, 22-b, 23-c, 31-a, 32-b, 33-c, 38-a, 39-b, 40-c, 41-a-b-c, and 44-c. One year of successful teaching experience will be considered to be equivalent to Education 41-a-b-c.

Candidates will be counselled to project a year of work which will permit concentration in: (1) Educational Psychology, (2) Educational Philosophy, (3) Administration and Supervision, or (4) Teaching Technique.

EDUCATION

31-a. The Psychology of Childhood. An intensive study of the development of the mind from childhood to adolescence. A careful interpretation of the development of the individual's mental processes with a view to proper methods of education is given special attention. Lectures, problems, assigned readings and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

32-b. Psychology of Adolescence. The purpose of this course is to give high school principals and teachers a deeper appreciation of the habitual and impulsive life of boys and girls in their teens. Topics: pre-adolescence; the physical and mental traits of high school pupils; individual differences among high school pupils and their implications; motor training, gymnastics, athletics, play, sport, and games as they function in the education of the youth; growth of social ideas; adaptation of school work to intellectual development; moral and religious training. Lectures, problems, assigned readings and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

33-c. Psychology of Learning. This course considers the nature of learning and retention, and their neural bases; learning curves, their uses and significance; forms of learning; motives to learning; factors and conditions affecting the rate and permanency of learning; problems relating to learning capacity; transfer of training, and means of effecting beneficial transfers; applications to practical school work, and to the training of persons requiring special treatment. Lectures, assigned readings and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

35-a. Measurements and Statistics. This course deals with the principles, methods and application of various types of scales for measuring general mental ability and educational achievement. It includes

GRADUATE SCHOOL

a brief survey of statistical methods essential to an understanding of testing. Sufficient practice in giving tests is provided to give the student an appreciation of psychological methods of procedure.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

36-b. The Measurement of Achievement. This course will furnish an opportunity to study the results of education as measured by evidence that children are learning. Some of the topics discussed are: school marks; the development of standard tests; the diagnostic and prognostic study of tests; the interpretation of the results of achievement tests; how to develop scales in various secondary school subjects; the effects of measurements on examinations, scholarship marks, methods, supervision, courses and the like. Lectures, assigned readings, problems and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

37-c. Measurement of Aptitudes and Mental Alertness. This course will concern itself with the problem of analyzing various types of intelligence. It deals with the chief facts of normal, mental, physiological and anatomical development as a basis for differentiation in classroom procedure. Some attention will be given to the problem of adjustment among super-normal and sub-normal pupils. A technique of the administration of group and individual tests is studied and emphasis is laid upon performance tests. Lectures, assigned readings, problems, and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

38-a. Secondary Education in the Union High School. The evolution of the junior high school; its particular features and functions; the attempt to humanize the education of adolescents and advance the cause of democracy are some of the topics discussed. Considerable attention is given to the program of studies for and administration of junior high schools. Consideration is given in this course to extra-classroom activities and their articulation with classroom procedures. Lectures, assigned readings, problems, discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

39-b. Secondary Education. Evolution of secondary schools, their articulation with elementary schools, colleges, technical institutes, vocations, and the home; teaching staff; curriculum; student organizations; life guidance; aims and values of the various high school subjects; extra curricular activities. An extra section is provided to accommodate

UNIVERSITY OF NEW HAMPSHIRE

Smith-Hughes students. Lectures, assigned readings, problems and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

40-c. Classroom Management and Methods. A consideration of the purposes of high school instruction; economy in classroom management; selection and arrangement of subject matter; types of learning involved in high school subjects; the place of practice or drill; the significance of reflective thinking and correct habit formation; the art of questioning; directed study; the measurement of the results of teaching. An extra section is provided to accommodate Smith-Hughes students. Lectures, assigned readings, problems and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

42-a. History and Principles of Vocational Education. The historical development of vocational education. The psychological and sociological bases of vocational education; problems, institutions, methods, contemporary movements and legislation; applications of research in relating vocations and education. Lectures, assigned readings and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

43-b. Hygiene of the School Child. This course will consider some of the more important chapters in modern school hygiene: conditions that determine growth and development, physiological age, the physical and mental differences between children and adults, the general principles of somatic and mental hygiene, tests of ability to work and physical condition, medical inspection, the development of habits of healthful mental activity and the hygienic aspects of various school exercises. Lectures, assigned readings, cases and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

44-c. New Hampshire State Program of Studies and School Law. This course will consider the aims and purposes, the plan of organization and administration of the secondary school as outlined in the New Hampshire State Program of Studies. This program of studies will be evaluated in the light of those used in other states, and students will have an opportunity here to become thoroughly acquainted with the secondary school organization in New Hampshire. Similar emphasis will be placed on the New Hampshire School Law. Lectures, assigned readings, and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

GRADUATE SCHOOL

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

45-a. School Administration. A subject in the fundamental principles of school administration intended primarily for superintendents, and for those who are preparing to become superintendents or supervisors, or directors of educational research. Topics: principles of scientific management applied to school administration; organization of departments of education; school records and reports; problems of school finance, including budget making; the use of score cards in judging school buildings; school building plans; the organization of special schools; the organization of special phases of school work as health education, compulsory attendance; the organization of the single school; the training of school superintendents and supervisors; the uses of school surveys; the publicity work of a school system. References, reports on special topics and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

46-b. High School Administration. The following topics will be covered: the legal status of the secondary high school; high school population; the problem of reorganization; the program of studies; vocational education and guidance in the high school; grading, measurement, classification, excess credit for quality; enrolling the student, social organization; community relationships; the high school library, staff, buildings, costs and efficiency. Lectures, assigned, readings and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

47-c. Principles of Education. Selected biological, psychological, sociological and statistical material will be treated in such a way as to give the student not only a survey of the fundamental principles of education, but also a good basis for more intensive courses in education. Educational theory stressing the more important principles involved in the process of education, especially in the secondary schools. Lectures, assigned readings and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

AGRICULTURAL EDUCATION

48-b. Agriculture in the High School. This subject deals with special methods of teaching agriculture in the high school, with emphasis upon New Hampshire requirements as set up by the State Board of Education. The chief topics considered are: planning and equipping of

UNIVERSITY OF NEW HAMPSHIRE

classrooms and shops, cataloging of bulletins for the library, selection of reference books, use and construction of charts and illustrative materials, the curriculum, the yearly plan of work; the presentation of materials of instruction through recitation, laboratory, field work and excursions; teaching through the home project, and supervised study.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

52-a. Educational Problems. (Democracy in Education and Character Development.) This course will discuss student participation in high school control; social functions, their nature, supervision, time, and place. The underlying principles of club work, together with a discussion of organization and administration of typical clubs of senior high schools, will be given careful attention. The problem of character education and a discussion of the moral standards in our high schools as revealed by investigations will furnish the student with concrete evidence in this interesting field. Lectures, assigned readings, problems, and problems of research.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

53-b. Educational Problems. (Educational and Vocational Guidance.) This course endeavors to make clear the problems with which the school counselor, the employment manager, and the intelligent individual himself have to deal. It discusses the beginnings of the guidance, pseudo-guidance, counselors' work in junior and senior high schools, and shows the intelligent student how he may guide himself. This latter objective is accomplished by giving him information as to himself, his mental capacity, his physical personality, his emotional reactions, information as to the division of labor, the requirements of the particular occupations in which he is interested together with their opportunities for self-expression, the methods of securing a position and obtaining advancement. An attempt will be made to organize a program of guidance to be used in New Hampshire secondary schools. Lectures, assigned readings, projects, problems, case studies with special reports.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

54-c. Educational Problems. (The Psychology of Management.) This course is designed to help those who are concerned with administration and supervision, whether in the teaching profession or in any business occupation, to establish and maintain that human efficiency which results from high group morale. There will be a discussion of teacher

GRADUATE SCHOOL

participation through advisory council, shop committee plans, and other means of promoting democracy in the field of management. Three-tenths of the time of this course will be devoted to the consideration of the psychology of camp leadership, and special lectures will be introduced through the coöperation of the college Y. M. C. A. and Y. W. C. A. The camp leadership section will be open to all students and will carry three time units credit. Projects, problems, topical reports and discussions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

55-a, 56-b, 57-c. **Research in Educational Psychology.** To be arranged.

101-a, 102-b, 103-c. **Research in Administration and Supervision.** To be arranged.

ENGLISH

ALFRED E. RICHARDS, *Professor*

HAROLD H. SCUDDER, *Associate Professor*

WILLIAM G. HENNESSEY, *Assistant Professor*

CLAUDE T. LLOYD, *Assistant Professor*

The candidate for an advanced degree who selects English as his major subject must have a reading knowledge of French and German, or of Latin and German.

SUBJECTS FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

20-a,-b. **History of Seventeenth Century English Literature.** A survey of prose and poetry (exclusive of the drama) from 1600 to 1700.

Lec. or rec., 3 hrs.; prep., 6 hrs.; 9 units. No credit is given for only one term's work.

20.5-a, -b. **Milton.** A detailed study of Milton's minor poetry and *Paradise Lost*. Consideration is also given to the social, political and religious history of Milton's day as reflected in his life and poetry.

Lec. or rec., 3 hrs.; prep., 6 hrs.; 9 units. No credit is given for only one term's work.

22-b. **The English Novel in the Nineteenth Century.** A study of the novel from Jane Austen to Thomas Hardy. There will be lectures, recitations, and constant outside reading.

Lec. or rec., 3 hrs.; prep., 8 hrs.; 11 units.

UNIVERSITY OF NEW HAMPSHIRE

26.5-a. The English Romantic Poets. This course is designed to cover the so-called romantic movement in English poetry. The causes and characteristics of the movement will be studied while special attention is being given to the poetry of Wordsworth, Coleridge, Scott, Byron, Shelley and Keats.

Lec. or rec., 3 hrs.; prep., 6 hrs.; 9 units.

27-a, 28-b, 29-c. Shakespeare's Plays. A study of the principal plays of Shakespeare. A large amount of reading required.

Lec. or rec., 3 hrs.; prep., 6 hrs.; 9 units.

31-b. Comparative Study of the Drama. Reading of selected dramas from European literature; Aeschylus to Ibsen. Constant reading, written criticisms and reports required.

Lec. or rec., 3 hrs.; prep., 6 hrs.; 9 units.

29-b. The American Novel. A survey of the novel in America from Charles Brockden Brown to the present time. There will be lectures and constant outside reading.

Lec. or rec., 3 hrs.; prep., 8 hrs.; 11 units.

85-a, 86-b, 87-c. The English Language. The history and development of the English language from Old English to that of today.

Lec. or rec., 3 hrs.; prep., 6 hrs.; 9 units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

101-a, 102-b, 103-c. Collateral Reading. The reading and discussing of selected masterpieces from the literature of the world. A term paper required of each student.

Lec. or rec., 3 hrs.; prep., 9 hrs.; 12 units.

104-a, 105-b, 106-c. Chaucer. An intensive study of Chaucer's *Canterbury Tales*, supplemented by readings from his minor poems. A reading knowledge of Old English or of Middle English is required.

Lec. or rec., 3 hrs.; prep., 9 hrs.; 12 units.

ENTOMOLOGY

W. C. O'KANE, *Professor*

P. R. LOWRY, *Assistant Professor*

The aim of graduate study in this department is to prepare a student for professional work in one or more of the several specialized divisions of Economic Entomology. Such preparation requires more time and

GRADUATE SCHOOL

effort than that represented by the four years of undergraduate college work. It assumes that in his undergraduate studies the student has laid a groundwork of general entomology and appropriate related sciences.

The student who wishes to enter graduate work will be expected to present such a foundation, its details depending on the phase of professional entomology in which the student desires to specialize. Related sciences presented may include subjects in zoölogy, chemistry, botany, plant pathology, bacteriology, horticulture, or physics, in various combinations. Consultation with the head of the Department of Entomology will determine the prerequisites necessary in a given case.

SUBJECTS FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

Under suitable circumstances graduate credit may be obtained for the following subjects, which are open also to undergraduates, provided the permission of the head of the Department of Entomology is secured, and provided that the graduate student completes additional work in these subjects and attains superior grades.

2-a. Insects of Orchard and Garden. The application of methods of insect control to typical injurious species. Studies in the life histories and habits of important insect pests of orchard, garden and certain field crops.

Prerequisite: Entomology 1-a. Lec., 2 hrs.; lab., 2½ hrs.; prep., 3 hrs.; 7½ units. Given in alternate years beginning with 1926-27.

3-b. Insects of Domestic Animals. The insect enemies of domestic livestock; the life histories, habits and means of control.

Prerequisite: Entomology 1-a. Lec., 2 hrs.; lab., 2½ hrs.; prep., 3 hrs.; 7½ units. Given in alternate years beginning 1927-28.

4-c. Household Insects. Medical Entomology. The life histories, habits and means of control of insects of the household and of stored products. The relation of insects to disease.

Lec., 2 hrs.; lab., 2½ hrs.; prep., 3 hrs.; 7½ units.

5-a, 6-b, 7-c, Advanced Economic Entomology. Detailed studies of subjects involved in applied entomology. The literature of economic

UNIVERSITY OF NEW HAMPSHIRE

entomology. Investigational practice. Original studies in the life history and habits of injurious species. Adapted for advanced students.

Required of students specializing in Entomology. Hours and units to be arranged.

8-a, 9-b, 10-c. Advanced Economic Entomology. Continuation of Entomology 5-a, 6-b, 7-c, for students who are specializing in the subject.

Required of students specializing in Entomology. Hours and units to be arranged.

13-c. Forest Insects. Studies in the life histories and habits of the more destructive forest insects and the means of their control.

Prerequisite: Entomology 1-a. Elective for others. Lec., 2 hrs.; lab., 2½ hrs.; prep., 3 hrs.; 7½ units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

The following subjects represent a sequence of studies arranged to include such branches as insect anatomy, insect physiology, details of taxonomy, insect behavior, insect ecology, problems in dispersion, the organization of research, the organization of regulatory measures, and other phases involved in professional entomology. The sequence includes, also, the planning and prosecution of a problem in research, with presentation of the results in the form of a thesis.

14-a, 15-b, 16-c. Graduate Entomology.

Prerequisites: Entomology 5-a to 7-c, or the equivalent.
Units and hours to be arranged.

17-a, 18-b, 19-c. Graduate Entomology.

Prerequisite: Entomology 5-a to 7-c, or the equivalent.
Units and hours to be arranged.

HORTICULTURE

GEORGE F. POTTER, *Professor*

J. RAYMOND HEPLER, *Assistant Professor*

L. PHELPS LATIMER, *Instructor*

Graduate work in Horticulture is offered to students who desire training for professional work, and who have fulfilled the requirements for undergraduate students majoring in Horticulture at this or a similar

GRADUATE SCHOOL

institution. A reading knowledge of French and German is desirable. The student should also have had sufficient practical experience to enable him to understand and appreciate the problems of Horticulture.

Students will find the department well equipped for fundamental research on horticultural problems.

SUBJECTS FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

5-a. Systematic Survey of Fruits and Vegetables. A study of the more important species of fruits and vegetables and their botanical relationships.

Lec., 2 hrs.; prep., 3 hrs.; 5 units.

6-b. Advanced Pomology. A detailed study of fundamental principles and experimental data and their application and relation to orchard problems such as growth and rest period in fruit plants, water requirements, soil management, pruning, fruit bud formation, fruit setting, pollination, thinning, winter injury, and the quality and keeping period of fruits in storage.

Lec., 3 hrs.; prep., 5 hrs.; 8 units.

10-b. Evolution and Improvement of Plants. The application of the principles of genetics to agricultural plant breeding. Hybridization and selection are studied as means of improving horticultural varieties of plants. It is preferably preceded by genetics (Zoölogy 32-a).

Lec., 2 hrs.; prep., 3 hrs.; 5 units. Given in alternate years beginning 1927-28.

12-a, 12.5-b. Horticultural Seminar. A review of the recent horticultural literature and methods of investigational work.

Lec., 2 hrs.; prep., 2 hrs.; 4 units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

101-b. Critical Survey of Horticultural Literature. A discussion of scientific and experimental evidence bearing on flower formation, growth, and composition of fruit plants, alternate bearing of apples, and soil management and fertilization of orchards.

Lec., 3 hrs.; prep., 9 hrs.; 12 units.

102-b. Methods of Horticultural Research. An examination of methods used in laboratory and field by horticultural investigators.

Lec., 2 hrs.; prep., 4 hrs.; 6 units.

UNIVERSITY OF NEW HAMPSHIRE

103-a. Critical Survey of Horticultural Literature. A continuation of Horticulture 101, dealing with the subject of winter injury to fruit plants.

Lec., 2 hrs.; prep., 6 hrs.; 8 units.

104-b. Critical Survey of Horticultural Literature. A continuation of Horticulture 103, dealing with the problems of water relations, rest period, propagation, pruning and thinning of orchard fruits.

Lec., 3 hrs.; prep., 9 hrs.; 12 units.

105-c. Critical Survey of Horticultural Literature. A continuation of Horticulture 104, dealing with pollination, fruit setting, color development, and storage of fruits.

Lec., 2 hrs.; prep., 6 hrs.; 8 units.

106-a. Problems in Vegetable Production. A critical study of the physiological problems involved in vegetable production.

Lec., 3 hrs.; prep., 9 hrs.; 12 units.

125. Research in Horticulture. Units to be arranged.

HISTORY

DONALD C. BABCOCK, *Professor*

THORSTEN KALIJARVI, *Assistant Professor*

ARTHUR W. JONES, *Assistant Professor*

ALLAN B. PARTRIDGE, *Instructor*

Admission to Graduate Study.—The completion of 90 time units of history, exclusive of History 101-a, 102-b, 103-c, with an average grade of 75 or better.

Admission to Candidacy.—In addition to the above requirements, a reading knowledge of a foreign language.

Objectives.—In general, two classes of graduate students may find it profitable to do their major work in this department. The first consists of students who desire a more extended knowledge and a more complete historical background to round out a liberal education, and perhaps to prepare them for the teaching of history. The second consists of those who wish to specialize on some phase of New England history, preferably that of New Hampshire.

GRADUATE SCHOOL

Plan of Work: General Course.—Students seeking the general background referred to above will do most of their work in supervised reading, with frequent conferences with the head of the department, or other instructors. The work will include phases of intellectual history, biography, historiography, philosophy of history, and problems of the history teacher.

Special Course.—Those wishing to specialize in the history of New England will be expected to write a thesis on some topic within this field. For this purpose the facilities for research are considerable, including the Library of the University, the State Historical Library in Concord, and various town records, private documents, unrecorded personal memoirs, landmarks, etc. A part of the work of this department is conceived to be the discovery and conservation of source material existing in the material and mental accumulations of the older type of New England population.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

1-a. New England History to the Revolutionary Period. This subject takes up the European background of New England, the origins of the separate New England colonies, and the development of their distinguishing traits. 12 time units.

2-b. New England History from the Opening of the Revolutionary Period to about 1820. This subject emphasizes, among other considerations, the part played by New England in the struggle for independence, and its contribution to the foundations of the new nation. 12 time units.

3-c. New England History since 1820. Deals partly with the influence of New England upon the rest of the country, and partly with the internal changes in New England in the nineteenth and twentieth centuries. 12 time units.

4-a, 5-b, 6-c. Seminar or Research in New Hampshire History. Selected topics will be assigned for individual investigation, such as transportation routes, rural decline, the development of the mill town, etc. The relation to the economic and social well-being of New Hampshire will be kept in mind. 12 time units.

7-a, 8-b, 9-c. Historic Reading and Theory. See above, "Plan of work, general course." 15 time units, or more by arrangement.

UNIVERSITY OF NEW HAMPSHIRE

LANGUAGES

HAMILTON FORD ALLEN, *Professor*

PAUL P. GRIGAUT, *Instructor*

To pursue graduate work in French, an applicant, if a graduate of the University of New Hampshire, must have majored in French, and have pursued subjects 13-a, 14-b, 15-c (or have a knowledge of written and spoken French equal to that gained by pursuing those subjects). If a graduate of another institution, an applicant must show by his record and by his ability to write and speak French that he is prepared to undertake the work.

SUBJECTS FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

French 19-a, 20-b, 21-c. Recent Tendencies in French Literature. Studies of the tendencies in French literature of the later nineteenth century and the beginning of the twentieth century. This subject is open to a limited number of qualified undergraduates and to graduate students. Permission of the instructor is required before enrollment.

Lec. or rec., 3 hrs.; prep., 9 hrs.; 12 units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

French 101-a, 102-b, 103-c. The Classic Drama. Reading of plays and study of the technique and sources of the classic drama.

Lec. or rec., 3 hrs.; prep., 9 hrs.; 12 units.

French 107-a, 108-b, 109-c. The Eighteenth Century in French Literature. A study of the life and thought of the eighteenth century in France as expressed in its literature.

Lec. or rec., 3 hrs.; prep., 9 hrs.; 12 units.

MATHEMATICS

HERMON L. SLOBIN, *Professor*

GEORGE N. BAUER, *Associate Professor*

WALTER E. WILBUR, *Assistant Professor*

GABRIEL H. COLLIGNON, *Assistant Professor*

SUBJECTS FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

10-a, 11-b, 12-c. Advanced Calculus and an Introduction to Differential Equations.

Prerequisite: Mathematics 9. Rec., 3 hrs.; prep., 4½ hrs.; 7½ units.

GRADUATE SCHOOL

14-b, 15-c. The History of Mathematics. This course is designed especially for those preparing to teach mathematics in the high schools. It aims to give an historical background and an appreciation of the development of various fields of mathematics.

Prerequisite: Mathematics 9. Rec., 3 hrs.; prep., $4\frac{1}{2}$ hrs.; $7\frac{1}{2}$ units.

16-a, 17-b, 18-c. Secondary School Mathematics. A study of the content and the method of teaching secondary school mathematics.

Prerequisite: Mathematics 203; or 1, 2 and 3. This course can count for graduate credit only for students whose major is education. Rec., 3 hrs.; prep., $4\frac{1}{2}$ hrs.; $7\frac{1}{2}$ units.

19-a, 20-b, 21-c. Advanced Plane and Solid Analytical Geometry.

Prerequisite: Mathematics 9. Rec., 3 hrs.; prep., $4\frac{1}{2}$ hrs.; $7\frac{1}{2}$ units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

50-a, 51-b, 52-c. Sequences and Series. An introduction to advanced analysis.

Prerequisite: Mathematics 9. Rec., 3 hrs.; prep., 6 hrs.; 9 units.

53-a, 54-b, 55-c. Higher Plane Curves. Coördinate systems; algebraic curves; application of the theory of invariants to higher plane curves of the third and fourth order; application of calculus to analytic geometry.

Prerequisite: Mathematics 9. Rec., 3 hrs.; prep., 6 hrs.; 9 units.

60-a, 61-b, 62-c. Theory of Functions of a Real Variable.

Prerequisite: Mathematics 9. Rec., 3 hrs.; prep., 6 hrs.; 9 units.

70-a, 71-b, 72-c. Theory of Functions of a Complex Variable.

Prerequisite: Mathematics 9. Rec., 3 hrs.; prep., 6 hrs.; 9 units.

80-a, 81-b, 82-c. Theory of Equations, with an Introduction to Group Theory.

Prerequisite: Mathematics 9. Rec., 3 hrs.; prep., 6 hrs.; 9 units.

83-a, 84-b, 85-c. Mathematical Statistics. This course deals mathematically with such subjects as frequency distribution including

UNIVERSITY OF NEW HAMPSHIRE

the curve of normal distribution and Pearson's generalized frequency curves, curve-fitting by least squares and moments, random sampling, and correlation. The theoretical considerations are applied to practical problems.

PHILOSOPHY AND PSYCHOLOGY

(See also Applied Psychology under Education.)

HERBERT F. RUDD, *Professor*

ADOLPH G. EKDAHL, *Assistant Professor*

Prerequisites for majoring in this department will vary according to the plan of specialization of the candidate. For all of those majoring in philosophy the basic 90 units must include a minimum of 30 units in psychology, and 30 units in philosophy supplemented by maturity of outlook and a broad foundation in such subjects as history, literature, sociology, education, economics and biology. Even advanced mathematics and physics might be prerequisite for dealing with certain problems in this field.

PHILOSOPHY

32-a. The Changing World and Changing World-Views. Following a brief survey of historic backgrounds, attention will be focused upon problems arising out of the revolutionary changes in the scientific, economic and cultural situation which exists today. 10 units.

33-b. Ethics. This includes a survey of the evolution of morality, an evaluation of ethical standards, and an analysis of motives for worthy conduct in the modern world. 10 units.

34-c. Logic. This course investigates the nature of good reasoning, the factors which help and the factors which hinder adequate thinking. 10 units.

41-a. History of Philosophy. This course deals with the more important attempts to find a rational explanation of the world from the sixth century B.C. to the end of the eighteenth century A.D. 10 units.

42-b. Modern Philosophy. A study of European and American philosophers since Kant. 10 units.

43-c. The Philosophy and Culture of China and Japan. An introduction to the great thinkers of the Far East and the circumstances under which they arose. 10 units.

GRADUATE SCHOOL

44-c. Literary Contributions to Philosophy. A study of philosophic doctrines as revealed in selected literary materials. Extensive readings form the basis of discussion. (Alternate years. Offered in 1929-30.) 10 units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

107-a, 108-b, 109-c. Advanced Problems in Philosophy. Credit to be arranged.

PSYCHOLOGY

Students desiring to major in psychology must offer a minimum of 30 units in general psychology. The remaining 60 units may be selected from any or all of the following subjects: general psychology, educational psychology, social psychology, applied psychology and zoölogy.

37-a. Experimental Psychology. Simple experiments on the sensations. Emphasis will be given toward the development of the proper technique of psychological investigation.

Lec. and lab., 6 hrs.; prep., 4 hrs.; 10 units.

38-b. Experimental Psychology. Experiments on the complex mental processes involving perception, association, imagination, learning and reaction time.

Lec. and lab., 6 hrs.; prep., 4 hrs.; 10 units.

39-c. Experimental Psychology. Psychophysical measurements, the determination of Weber constants, Limens of sensibility, etc.

Lec. and lab., 6 hrs.; prep., 4 hrs.; 10 units.

47-a. Physiological Psychology. A study of the physical basis of mind, nerve functions and their correlations with mental processes.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

48-b. Comparative Psychology. A study of psycho-genesis or the development of "mind" beginning with the one-celled organisms.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

49-c. Abnormal Psychology. A study of abnormal phenomena such as disorders of perception, association, memory, judgment and personality. The psychoses and psychoneuroses will be considered and a brief review of mental deficiency presented. Visits to institutions.

Lec. or rec., 3 hrs.; prep., 7 hrs.; 10 units.

UNIVERSITY OF NEW HAMPSHIRE

51-a, 52-b, 53-c. Seminar. Special Problems in Psychology. Credit to be arranged.

104-a, 105-b, 106-c. Research in Psychology. Problems of either an experimental or theoretical nature may be pursued. Credit to be arranged.

ZOÖLOGY

C. F. JACKSON, *Professor*

A. D. JACKSON, *Assistant Professor*

E. M. TINGLEY, *Instructor*

The special requirements for graduate work in Zoölogy include a thorough foundation in the principles of zoölogy, and the equivalent of 150 units in this and allied sciences.

SUBJECTS FOR ADVANCED UNDERGRADUATE AND GRADUATE STUDENTS

36-a, 37-b, 38-c. Histology.

Lec. or rec., 2 hrs.; lab., 6 hrs.; prep., 2 hrs.; 10 units.

39-a, 40-b, 41-c. Embryology.

Lec. or rec., 3 hrs.; lab., 4 hrs.; prep., 3 hrs.; 10 units.

42-a, 43-b, 44-c. Advanced Physiology.

Lec. or rec., 3 hrs.; lab., 4 hrs.; prep., 3 hrs.; 10 units.

60-s. Invertebrate Morphology and Taxonomy.

Lec. or rec., 5 hrs.; lab., 5 hrs.; prep., 10 hrs.; 10 units.

61-s. Vertebrate Ecology.

Lec. or rec., 3 hrs.; lab., 4 hrs.; prep., 10 hrs.; 10 units.

62-s. Comparative Embryology.

Lec. or rec., 5 hrs.; lab., 5 hrs.; prep., 10 hrs.; 10 units.

63-s. Advanced Comparative Anatomy of Vertebrates.

Lec. or rec., 5 hrs.; lab., 5 hrs.; prep., 10 hrs.; 10 units.

SUBJECTS PRIMARILY FOR GRADUATE STUDENTS

80-a, 81-b, 82-c. Advanced Taxonomy. Critical examination of select groups of vertebrates and invertebrates with special reference to local forms, their classification, distribution, and phylogeny.

Prerequisites: Three years' work in Zoölogy. Lec. or rec., 2 hrs.; lab., 4 hrs.; prep., 4 hrs.; 10 units.

GRADUATE SCHOOL

83-a, 84-b, 85-c. Advanced Comparative Morphology. A critical and detailed study of the structure and function of aberrant forms and a comparison with the types of the group to which they belong.

Prerequisites: Three years' work in Zoölogy. Lec. or rec., 2 hrs.; lab., 6 hrs.; prep., 2 hrs.; 10 units.

86-a, 87-b, 88-c. Advanced Vertebrate Ecology. A study of advanced ecological problems and their correlation with morphology, physiology, and taxonomy as exemplified by local associations and cenoses.

Rec. or lec., 2 hrs.; lab., 4 hrs.; prep., 4 hrs.; 10 units.

89-a, 90-b, 91-c. Experimental Genetics. Studies of the effect of hormones, introduced toxins, or drugs on the term plasm or modification of the offspring when such drugs are given to the parent. The relation of chromosomes to inheritance will be considered experimentally.

Prerequisites: Three years' work in Zoölogy, including Genetics. Lec. or rec., 1 hrs.; lab., 6 hrs.; prep., 3 hrs.; 10 units.

92-a, 93-b, 94-c. Comparative Embryology. A detailed study of the embryonic history of selected types of animals with special emphasis on basic embryological principles.

Prerequisites: Three years' work in Zoölogy, including Embryology. Lec. or rec., 3 hrs.; lab., 4 hrs.; prep., 3 hrs.; 10 units.

99a-b-c. Special Problems. Advanced students may elect this work provided they present a detailed outline of the problems which they wish to investigate and, furthermore, provided they can furnish adequate proof of their ability to carry the problem in view of their past training and the equipment available.

Prerequisite: By special permission. Units to be arranged.

$\frac{1}{4}$ Mile



This map shows the buildings of the University and the immediately adjacent grounds. It does not include the farms, forests, gardens or orchards.

